

BREEDING, FEEDING AND ARBOREALITY IN *PARADELMA ORIENTALIS*: A POORLY KNOWN, VULNERABLE PYGOPODID FROM QUEENSLAND, AUSTRALIA

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On Boyne Island, in central Queensland, *Paradelma orientalis* (Gunther, 1876) is nocturnal and (at least) partly arboreal. Specimens are found frequently on the trunks of *Acacia falciformis*. They feed, but not exclusively, on the sap of *A. falciformis* while scats analysis has also revealed remains of arthropods. *P. orientalis* is active in warm months and inactive when the night maximum temperature falls below 19°C. One female specimen encountered during this study laid two elongate eggs (34 × 12mm, 37 × 11mm) which hatched 81 ± 1 and 82 ± 1 days later. At emergence, neonates measured 69.0 and 72.0mm, respectively. □ *Pygopodidae*, *Paradelma orientalis*, sap-feeding, arboreality, reproduction, Brigalow Belt.

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Paradelma orientalis (Gunther, 1876) is one of four pygopodids confined to Queensland. Its distribution has been reviewed recently by Schulz & Eyre (1997). *P. orientalis* occurs in a wide variety of open forest habitats on several soil types between the Carnarvon Ranges (25°19'S 148°20'E) and Eena State Forest, (28°19'S 150°50'E), via Inglewood; and between the Chesteron Ra. (26°09'S 147°14'E), via Charleville, and Boyne Island (23°56'S 151°20'E), via Gladstone. Although Wilson & Knowles (1988) reported *P. orientalis* to be '... moderately abundant, particularly on sandstone ridges ...', it has been regarded as 'restricted to specific habitats, vulnerable' (McDonald et al., 1991) and 'vulnerable' (Cogger et al., 1993; Nature Conservation Wildlife Regulation, 1994).

Most recently, under (IUCN definitions) it has been treated as 'vulnerable' with 'population reduction ... decline in area of extent of occurrence and ... quality of habitat ...' (Covacevich et al., 1998).

The bulk of this species' range lies in Queensland's Brigalow Belt, a region in which habitats are known to be seriously assailed by extensive clearing (e.g. Johnson, 1996).

Greer (1989) observed that two species of pygopodids (*Pygopus nigriceps* and *P. orientalis*) are 'largely, if not exclusively nocturnal'. Of the latter, he noted, '... active at night' (in captivity) but '... inactive by day'. Data on the biology of this species are scant. Save for one recent, brief account of sap-feeding by *P. orientalis* (Tremul, 1997), nothing has been added to knowledge of the habits of the species since the summary by

Greer (1989) 'Little is known of the biology ... found in woodland under cover ... reproduction in late spring and early summer ...'.

An apparently substantial and healthy population of *P. orientalis* was discovered on Boyne I., near the Lilly Hills Boyne Island Conservation Park in 1989. Observations made on specimens encountered there over ten years provide new data on arboreality, feeding and breeding behaviour and daily and seasonal activity cycles of *P. orientalis*. Hopefully this data will assist the conservation of a vulnerable species and highlight the significance of the *Acacia falciformis* woodlands on Boyne I.

STUDY SITE

Lilly Hills is in the SE portion of Boyne I. (23°56'54"S 151°20'53"E). Some 43.9ha of the hills are reserved under the Lilly Hills Boyne Island Conservation Park. A triangular section (defined by two almost perpendicular ridges) in the NE region (adjacent to the park) was selected as a study site, an area of approximately 13,000m² (Fig. 1). The vegetation in this area is a *Corymbia citriodora*/*Eucalyptus exserta*/*E. clarksonianal*/*E. crebra* tall woodland with a sparse upper-mid-stratum of *Acacia falciformis*, a sparse mid-stratum dominated by *Pogonolobus reticulatus*/*Jacksonia scoparia*/*Acacia conferta* and a sparse ground stratum dominated by *Xanthorrhoea latifolia* and clumps of *Entolasia stricta*, *Themeda triandra* and other tussock grasses. The substrate is covered by a dense layer of dry *Eucalyptus*/*Acacia* leaf litter. Soils are shallow and contain quartz, greywacke,



FIG. 1. Study area showing the coordinates of *P. orientalis* feeding trees A-J and SB. R1 = sugar glider feeding tree; R2 = *Gehyra dubia* feeding tree. Scale: distance between tree F and site SB = 17.7m.

mudstone and rare chert rock fragments. Very few large rocks occur in the area.

METHODS

Early observations indicated that *P. orientalis* was easily found at night, but difficult to locate by day; so all searches were made after sundown. Between 1989 and 1996 random searches were conducted throughout the northern region of Lilly Hills and alongside roads adjacent to the area. Observations of any activity were recorded. The data collected suggested that *P. orientalis* was reasonably common and active throughout the warmer months of the year. Some of the feeding trees during this period were measured and labeled as sites (Site A-H). Unfortunately many of these early sites on private land became inaccessible and were damaged by fire. As a result, in 1997 a smaller area, more suitable for comprehensive study, was selected (Fig. 1). On the 5/8/97 a maximum/minimum thermometer was placed in the shade of a grass-tree near the top of the SE ridge. Previous observations had suggested early August to be a dormant period and a suitable time to record the gradual temperature increases during late winter and monitor the commencement of activity of *P. orientalis*. The following night the SE ridge was searched on foot by torchlight. Maximum, minimum and current ground temperature were recorded, and a roughly diagonal path was taken to the top of the E ridge then back to the base corner (tree F, Fig. 1). A search of approximately one hour was conducted within an hour after dusk. This sequence of events was repeated for 48 consecutive nights. All observations were recorded and when any arboreal activity was seen the position of the specimen was estimated and the tree measured and labeled (tree A-G). Spacing between trees were later measured and exact positions were plotted by use of a compass and GPS (refer Fig. 1). Random searches were conducted again until late February 1998, when it was decided to measure as many individuals as possible during 12 consecutive nights. Four of these individuals were marked with white 'correction fluid' to enable them to be identified for a short period of time. This would hopefully give some indication of population size and establish whether or not individuals frequently visited the same tree. Random searches continued once again until May 1999. Searches during the following three months were increased to observe the beginning of the dormant period. The study concluded towards the

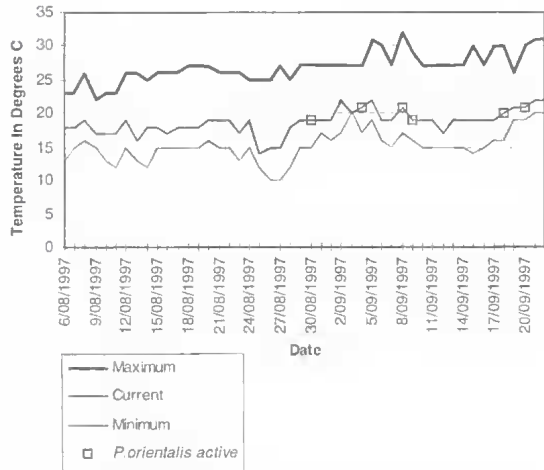


FIG. 2. Temperatures and activity recorded at *P. orientalis* site during August-September 1997.

end of July 1999. Scats were collected to ascertain if the species was an exclusive sap feeder.

RESULTS AND DISCUSSION

POPULATION SIZE. During the ten years of studying *P. orientalis* in the field, only 36% of specimens were handled and measured to minimise observer effect on behaviour. Between the 25/2/98 and the 8/3/98 (12 nights) 19 specimen measurements were recorded. Of these, 16 could be distinguished easily by dimensions and autotomy (Table 2). From these data, it seems reasonable to surmise that on Boyne I. at least, *P. orientalis* is fairly common. However, with land clearing of areas neighbouring the Lilly Hills, human population increase on the island and the introduction of roadside lighting, pressures are undoubtedly mounting. Lilly Hills Reserve and other areas supporting *Acacia falciformis* woodlands do provide a viable habitat and food source for *P. orientalis*.

DAILY ACTIVITY. Weather conditions on nights when *P. orientalis* were observed were generally warm, clear and still (Table 1). Hand-searches in the study area (1989) resulted in the collection of only one inactive specimen under a rock. Sporadic visual-searches (not listed in tables) over the following 10 years revealed no obvious diurnal activity, although disturbance to the areas was minimal. By contrast, using a battery-operated light for *P. orientalis* from early evening (within the first hour post sundown) till

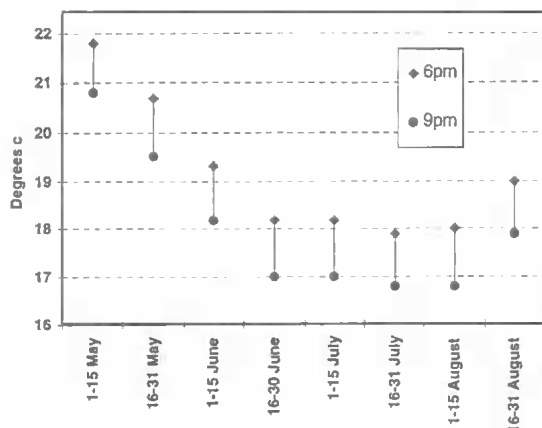


FIG. 3. Average ten-yearly temperatures (1989-1998). Temperatures recorded at Gladstone (Bureau of Meteorology).

0120 hours was successful. This study confirms that *P. orientalis* is nocturnal.

SEASONAL ACTIVITY. On Boyne Island *P. orientalis* is active between late August and early June (i.e. late Winter-Autumn). Data relating to late winter temperature ranges and associated behavioural observations of *P. orientalis* are summarised in Fig. 2 for August-September, 1997. No activity has been observed when the maximum night temperature was below 19°C. Observations throughout late autumn and winter (obs. #121-140 and obs. #42-65) and the ten yearly average temperatures for the Gladstone region (Fig. 3) suggest a dormant period between mid June and late August.

ARBOREALITY. Many pygopodids are known to climb into thick vegetation or on shrubs and trees. Greer (1989) summarises reports of such behaviour in *Pygopus lepidopodus*, *Lialis burtonis*, some *Delma* spp. and *Pletholax gracilis* noting that members of only two genera of pygopodids (*Ophidiocephalus*, *Aprasia*) do not climb. However, he records no evidence of arboREALITY in *P. orientalis*. Table 1 summarises observations of close to 10 years' encounters with *P. orientalis* specimens in trees or above ground. *P. orientalis* is rather conspicuous when perched on a feeding tree, the lead-grey colour often deeply contrasting. Specimens are able to climb the trunk by obtaining purchase on the rough, flaky bark (Fig. 4), and have been observed at heights in excess of 2m. Only the trunk and main branches are scaled. Feeding trees have been at varying growth stages (refer Table 3) and have only included *A. falciformis*. Specimens found



FIG. 4. *P. orientalis* scaling an *Acacia falciformis* trunk.

in/on these acacias represent 75% of all specimens encountered during the study. From the recorded data, only 25 of a total of 101 specimens/observations were encountered on the ground, of these, 10 were observed on roads (7 active and 3 roadkills). Of the 4 individuals that were marked, one specimen was observed active on Tree I during 3 consecutive nights (obs. #101-103). It appears likely that trees which provide an accessible supply of sap are visited frequently until the sap source dries up. Tree I was investigated closely and no bark or crevices were suitable for daily refuge of an animal of such size. However, Tree I was a small *A. falciformis* (refer Table 3) and other much larger trees may provide shelter as well as sap. The possibility of a 'home,' feeding tree could not be investigated properly without severe damage to the trees. Shea (1987) records finding a specimen of *P. orientalis* inactive in a fold in a sheet of stringybark lying alongside a large fallen eucalypt in the Moura district (CQ).

FEEDING. Pygopodids are known to include both generalist arthropod feeders (e.g. *Pygopus* spp.) and specialist ant and skink feeders (*Aprasia* spp. and *Lialis burtonis*, respectively), (Greer, 1989). However, until a preliminary observation from this study (Tremul, 1997), sap feeding was unknown amongst pygopodids and



FIG. 5. *P. orientalis* feeding on sap.

nothing was known about the feeding habits of *P. orientalis* (see Greer, 1989).

Table 1 details observations of sap-feeding on *Acacia falciformis* specimens by juvenile and adult specimens of *P. orientalis*. Sap constitutes a significant portion of the diet of *P. orientalis*. Newly hatched individuals have a natural instinct to climb in search of this food. A specimen measuring 69mm snout-vent-length (SVL) and 76mm tail length (TL) and weighing 1.5g (body measurements and weight consistent with those taken of the hatched neonates) was observed on the trunk of *A. falciformis*, 30cm from the ground (obs. #93). Sap feeding continues through to adulthood with observations being recorded during all seasonal activity (Fig. 5). Of the 76 specimens/observations on trees, 20% were feeding and a further 9 were in very close proximity to sap. Adult specimens have remained perched at feeding sites for up to 46 minutes. However, the species is not an exclusive sap feeder. Scats collected from an individual from the study site (obs. #111) have also contained spider and some cricket-like, orthopteroid remains and many unidentified insect fragments. Three other scats collected (25/1/99) outside of Boyne I. (20km, N of Dingo, CQ) have consisted of tightly compressed membranous material (mostly plant) and the remains of a large spider and cricket. Other animals also feed on the sap of *A. falciformis*. The Sugar Glider (*Petaurus breviceps*) and *Gehyra dubia*, a common gecko, both do so in the study area (obs. #88, #103, #107). The former is well known as a sap feeder and noted for its ability to make incisions into the bark of trees to assist sap flow. These gliders have been observed feeding on sap at a height and position well within reach of *P. orientalis*. The latter was reported recently to include sap in its

diet with feeding trees known to include *Acacia leiocalyx*, *A. conferta* and *A. decora* (Couper et al., 1995).

BREEDING. There is little data on breeding in all pygopodid lizards, no direct observation on any aspects of breeding in *P. orientalis* have been reported. It was believed to be an egg layer with a clutch size of two (e.g. Wilson & Knowles, 1988; Greer, 1989). During this study one gravid female *P. orientalis* was collected (27 October, 1994, obs. #30) and held captive in a closed container, consisting of leaf litter and moist, friable soil.

Between 6-8 November, 1994 this specimen deposited two pale, elongate eggs (34 × 12mm; 37 × 11mm). The latter weighed 3.9g (to maximise hatching chances, the former was not handled). Eggs hatched (81 and 82 ± 1 days later, during an estimated temperature range of 18-36°C) on 27 and 28 January, 1995. The hatching process took from 7.5-53 hours. First indication that the smaller egg was hatching occurred at 9.00am, 25 January, when transparent fluid exuded from a small slit in the shell. This continued for 12 hours, when a small, serrated object (possibly an egg tooth) protruded from the slit. Twenty-two and a half hours after the process had begun, the serrated object had been shed; at 28 hours the neonate began to emerge; final detachment from the egg/yolk was complete at 53 hours (on 27 January, 1995); refer Fig. 6. The second egg (diameter 12mm) began to hatch at 7.00am on 28 January. The process was similar but was completed in considerably less time (7.5 hours). At emergence, the neonates had the following dimensions and weights: SVL 69mm, 72mm; TL 71mm, 78mm; weight 1.5g, 1.7g. Both were released with their mother at the point of capture.

AUTOTOMY/AGGRESSION. Of the 16 individuals measured, 75% had varying stages of obvious autotomy (Table 2). No evidence of intraspecific aggression has been observed. Large adults feeding off the same clump of sap, and two sub-adults and a juvenile within very close proximity have not displayed any agonistic behaviour (obs. #41, #75). Predation on *P. orientalis* was not seen during this study. Vocalisation was only heard from one specimen handled (obs. #115) with the call consisting of a soft squeak. Specimens pursued in the open have occasionally flung themselves into the air (obs. #8, #32, #93), a habit shared by some species of *Delma* (see Greer, 1989).

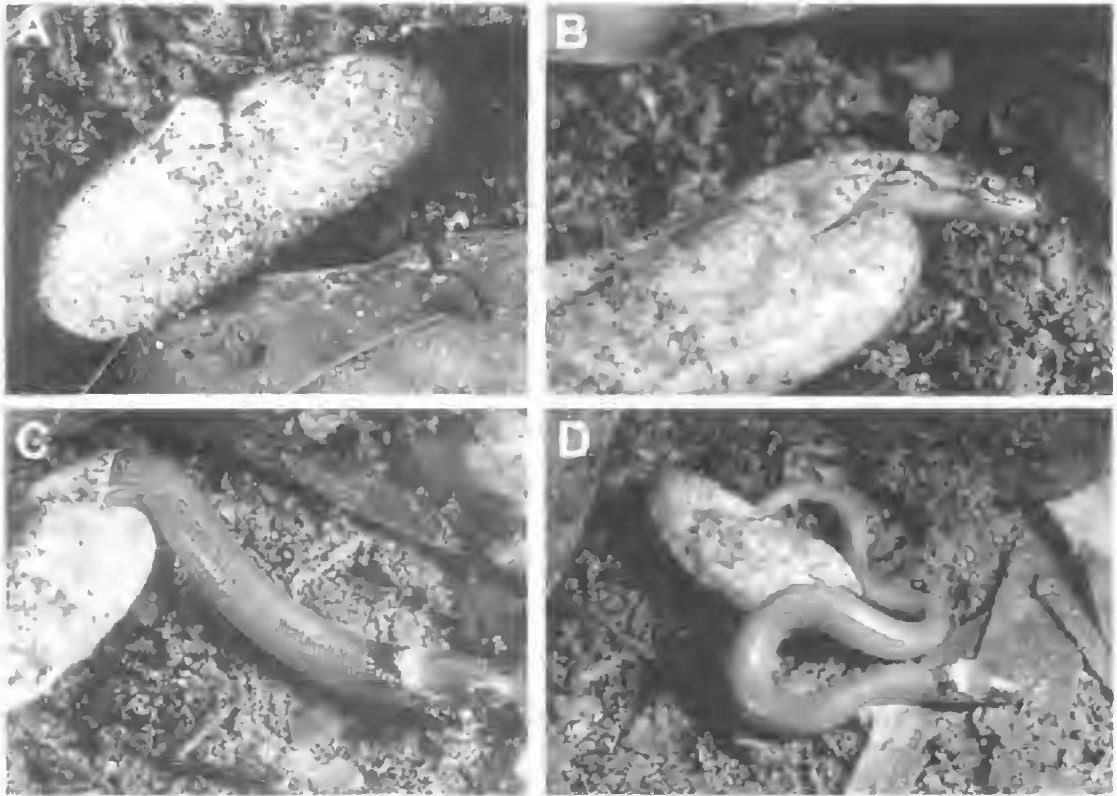


FIG. 6. *P. orientalis* hatching: A, fluid exuding from egg; B,C, neonate emerging from egg; D, neonate detaching from egg.

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TABLE 1. Observations of *P. orientalis*. # = observation number; Cu = current temp., m = minimum temp., M = maximum temp.; P = *P. orientalis*, J = juvenile, A = adult, S = sub-adult; rd = road, rk = road kill, T = tree, G = ground; u = up, d = down, hz = horizontal; y = yes, n = no, l = likely; nr = not recorded. Temperatures in bold measured at Lilly Hills, temperatures in italics measured at Gladstone (Bureau of Meteorology).

#	Date	Time	Temp. °C			Active/ loc.	Tree/ Grd.	Height/ Facing	Feed- ing	Weather / comments
			Cu	m	M					
1	18/4/89	7-9pm	<i>nr</i>	<i>20</i>	<i>29</i>	S/site b	T	0.4m/d	n	nr
2	22/4/89	7-9pm	<i>nr</i>	<i>21</i>	<i>27</i>	S/site a	T	0.15m	n	nr
3	28/4/89	7.40pm	<i>nr</i>	<i>19</i>	<i>29</i>	J/site c	T	0.2m/d	n	cloudless, no wind
4	10/12/89	7.20pm	<i>nr</i>	<i>21</i>	<i>30</i>	P/n r	T	nr	n	nr
5	11/12/89	7.30pm	<i>nr</i>	<i>21</i>	<i>32</i>	P,P/n r	T,T	nr	n	nr
6	14/12/89	8.05pm	<i>nr</i>	<i>23</i>	<i>32</i>	P/n r	T	nr	n	nr
7	17/12/90	8.50pm	<i>nr</i>	<i>23</i>	<i>31</i>	S/site c	T	nr/d	l	nr/ sap present near head
8	17/12/90	9.00- 10.00pm	<i>nr</i>	<i>23</i>	<i>31</i>	A/rd	G	-	-	nr/ specimen flung itself up into the air when pursued
9	18/12/90	10.20pm	<i>nr</i>	<i>22</i>	<i>31</i>	J/nr	G	-	l	nr/ specimen had its head in a groove of a trunk which contained sap
10	19/12/90	n/r	<i>nr</i>	<i>23</i>	<i>32</i>	A/n r	G	-	-	nr/ active in dense leaf litter, opposite study site
11	20/12/90	11.28pm.	<i>nr</i>	<i>23</i>	<i>32</i>	J/site d	T	nr/u	n	nr/ specimen retreated down burrow when disturbed
12	20/12/90	nr	<i>nr</i>	<i>23</i>	<i>32</i>	S/site c	G	nr	-	nr
13	21/12/90	8.08 - 8.54p.m	<i>nr</i>	<i>24</i>	<i>32</i>	A/site e	T	nr/u	y	nr/ specimen feeding for 46 minutes
14	4/1/91- 5/1/91	11.15pm- 12.01am	<i>nr</i>	<i>21</i>	<i>25</i>	none	-	-	-	100% overcast; strong to moderate wind heavy rain fell during the day; ground and trunks of Acacias damp.
15	5/1/91- 6/1/91	11pm- 12.01am	<i>nr</i>	<i>23</i>	<i>29</i>	none	-	-	-	100% overcast; high humidity; calm; heavy rain fell during the day; ground and trunks of Acacias damp.
16	6/1/91- 7/1/91	11.15pm- 12.15am	<i>nr</i>	<i>25</i>	<i>30</i>	none	-	-	-	75% overcast; calm; light drizzle occasionally; ground and trunks of Acacias saturated.
17	8/1/91	9.15pm- 10.10pm	<i>nr</i>	<i>23</i>	<i>29</i>	none	-	-	-	cloudless; moderate to strong SE wind; trunks of Acacias dry; ground damp.
18	9/1/91	8.30pm- 9.30pm	<i>nr</i>	<i>21</i>	<i>28</i>	none	-	-	-	moderate to strong SW wind; light rain during the day; ground and Acacia trunks dry.
19	10/1/91	8.20pm- 9.15pm	<i>nr</i>	<i>21</i>	<i>28</i>	none	-	-	-	strong SW wind; 75% overcast; ground and trunks of Acacias dry.
20	11/1/91	8.20pm- 9.15pm	<i>nr</i>	<i>21</i>	<i>30</i>	S,A,S/ site d,d, nr	T,G,T	nr	n	nr/ 3 specimens active; large <i>Lialis burtonis</i> active on ground at site c
21	15/1/91	9.15pm- 10.05pm	<i>nr</i>	<i>22</i>	<i>31</i>	P,P/nr	T,T	nr	n	10% cloud cover; no wind
22	29/8/91	8.10pm	<i>21</i>	<i>18</i>	<i>29</i>	P/nr	T	0.2m/u	y	10% cloud cover
23	30/8/91	8.30pm	<i>22</i>	<i>19</i>	<i>28</i>	A/nr	T	0.05m/d	n	no cloud cover
24	30/10/91	8.45pm	<i>nr</i>	<i>19</i>	<i>27</i>	P/rk	G	-	-	nr/ found on Handley Drive
25	13/9/93	nr	<i>nr</i>	<i>17</i>	<i>25</i>	P,P/nr, rd	T,G	0.03m /nr	-	nr/ second specimen found on Centenary Drive
26	20/9/93	nr	<i>nr</i>	<i>19</i>	<i>31</i>	P/rd	G	-	-	specimen active on Handley Drive
27	3/4/94	nr	<i>nr</i>	<i>21</i>	<i>31</i>	S/rk	G	-	-	found on Centenary Drive, opposite study site.

TABLE 1. (cont.)

#	Date	Time	Temp. °C			Active/ loc.	Tree/ Grd.	Height/ Facing	Feed- ing	Weather / comments
			Cu	m	M					
28	11/10/94	8.00pm	nr	18	28	P,P/nr	T,T	-	l	<10% cloud cover/ both specimens had their heads between loose bark and a clump of sap
29	21/10/94	nr	nr	20	30	P/rd	G	-	-	nr/ active on Handley Drive
30	27/10/94	nr	nr	18	28	P/rd	G	-	-	nr/ active on Handley Drive; gravid.
31	11/1/95	nr	nr	22	32	A/rd	G	-	-	nr/ active on Handley Drive.
32	21/3/95	7.45pm	nr	23	nr	S/rd	G	-	-	<10% cloud cover, warm/active on Handley Dr. specimen flung itself into the air in a similar manner to <i>Delma</i> .
33	27/3/95	7.30-8.00pm	nr	26	nr	P,P,P/nr	T,T,T	nr,nr, 1m/nr		<10% cloud cover/ there is an abundance of sap.
34	25/9/95	nr	nr	20	30	P,P,P/nr	T,T,T	0.67,1.2, 1.3/u,u,u	l,y,n	humid, cloudless night/ sp. 1 had sap present near head; sp.2 was feeding; sp.3 had sap 0.76m above it.
35	8/2/96	nr	nr	25	34	P,P,P/nr	T,T,G	nr	n	a warm, humid and cloudless night.
36	18/8/96	7.00pm	21	18	26	none	-	-	-	nr/ <i>Heteronotia bynoei</i> and <i>Morelia spilota</i> active.
37	17/11/96	8.00pm	nr	24	32	A/nr	T	0.2m/d	n	cloudless night/ sap 0.1m below head
38	18/11/96	nr	nr	24	36	A/nr	T	0.3m/up	n	cloudless, high humidity / specimen slowly moved up tree towards sap exudates.
39	22/1/97	nr	nr	20	28	A,A,A, A,A/ tree f, nr	T,T,T, T,T	nr	y,n,n, n,n.	nr/ three specimens clumsily fell to the ground when disturbed.
40	24/1/97	7.45-8.45pm	nr	22	nr	A/tree f	T	nr	y	nr/ specimen was photographed feeding on sap.
41	28/1/97	7.45-8.45pm	nr	26	32	A,A,P, P,P,P/ nr	T,T,T, T,G	2m,2.5m, nr/up,n, nr	y,y	warm, high humidity / one specimen climbing to a clump of sap (2m); another specimen from higher above (2.5m) climbed down to the same sap; both specimens fed off sap simultaneously, the presence of another individual tolerated.
42	6/8/97	7.35pm	18	13	23	none	-	-	-	40% cloud cover, no wind.
43	7/8/97	7.50pm	18	15	23	none	-	-	-	no cloud cover or wind.
44	8/8/97	8.00pm	19	16	26	none	-	-	-	50% cloud cover, no wind/ <i>Oedura rhombifer</i> active on tree
45	9/8/97	8.10pm	17	15	22	none	-	-	-	30% cloud cover, no wind/ heavy rain fell at 3am.
46	10/8/97	8.00pm	17	13	23	none	-	-	-	no cloud cover or wind/ a windy day; <i>Gehyra dubia</i> active.
47	11/8/97	8.10pm	17	12	23	none	-	-	-	no cloud cover or wind.
48	12/8/97	8.15pm	19	15	26	none	-	-	-	20% cloud cover, no wind/ <i>Gehyra dubia</i> active on ground.
49	13/8/97	7.45pm	16	13	26	none	-	-	-	no cloud cover, slight breeze/ strong moonlight.
50	14/8/97	8.10pm	18	12	25	none	-	-	-	no cloud cover, slight breeze/ waxing gibbous, strong moonlight.
51	15/8/97	7.35pm	18	15	26	none	-	-	-	no cloud cover, slight breeze/ strong moonlight.
52	16/8/97	7.55pm	17	15	26	none	-	-	-	no cloud cover, slight breeze/ strong moonlight.
53	17/8/97	8.05pm	18	15	27	none	-	-	-	no cloud cover or wind/ strong moonlight.
54	18/8/97	8.15pm	18	15	27	none	-	-	-	no cloud cover or wind/ full moon.
55	19/8/97	8.05pm	18	15	27	none	-	-	-	no cloud cover or wind.
56	20/8/97	7.55pm	19	16	27	none	-	-	-	no cloud cover or wind/ no moonlight; <i>Heteronotia bynoei</i> active.
57	21/8/97	7.40pm	19	15	26	none	-	-	-	10% cloud cover, slight breeze/ no moonlight.
58	22/8/97	7.35pm	19	15	26	none	-	-	-	10% cloud cover, slight breeze/ no moonlight.
59	23/8/97	7.55pm	17	13	26	none	-	-	-	no cloud cover or wind/ no moonlight.
60	24/8/97	7.40pm	19	15	25	none	-	-	-	no cloud cover, slight breeze/ no moonlight.
61	25/8/97	7.35pm	14	12	25	none	-	-	-	no cloud cover or wind/ no moonlight
62	26/8/97	8.00pm	15	10	25	none	-	-	-	no cloud cover, slight breeze/ no moonlight; sugar glider seen.
63	27/8/97	7.45pm	15	10	27	none	-	-	-	no cloud cover or wind/ no moonlight, calm and cold.
64	28/8/97	7.50pm	18	12	25	none	-	-	-	no cloud cover, slight breeze/ no moonlight.
65	29/8/97	7.40pm	19	15	27	none	-	-	-	40% cloud cover, slight breeze/ no moonlight.
66	30/8/97	8.00pm	19	15	27	S/ tree a	T	nr	n	40% cloud cover, moderate wind/ no moonlight, humid.
67	31/8/97	7.50pm	19	17	27	none	-	-	-	no cloud cover, slight breeze/ rat active in <i>A. falciformis</i>
68	1/9/97	7.55pm	19	16	27	none	-	-	-	no cloud cover slight breeze/ no moonlight.
69	2/9/97	7.52pm	22	17	27	none	-	-	-	60% cloud cover, moderate wind/ no moonlight.
70	3/9/97	8.15pm	20	20	27	none	-	-	-	30% cloud cover, slight breeze/ leaf litter damp, heavy rain fell during the day; no moonlight.
71	4/9/97	8.10pm	21	17	27	S/ tree b	G	-	-	40% cloud cover, no wind/ no moonlight.
72	5/9/97	8.15pm	22	19	31	none	-	-	-	no cloud cover, slight breeze/ <i>Oedura rhombifer</i> active on <i>A. falciformis</i> ; no moonlight.
73	6/9/97	8.17pm	19	16	30	none	-	-	-	no cloud cover, slight breeze/ waxing crescent.
74	7/9/97	8.35pm	19	15	27	none	-	-	-	no cloud cover or wind/ sugar glider seen; partial moonlight.

TABLE 1. (cont.)

#	Date	Time	Temp. °C			Active/ loc.	Tree/ Grd.	Height/ Facing	Feed- ing	Weather / comments
			Cu	m	M					
75	8/9/97	8.20pm	21	17	32	S,S,J, S,S/ tree c, d, d, d, a	T,G, G,G, T	nr	y,y	no cloud cover or wind, humid, poor moonlight/ five specimens active, two up trees; the other three on the ground at the base of tree d and in very close proximity to each other.
76	9/9/97	8.10pm	19	16	29	P/ tree e	T	nr	n	no cloud cover, slight breeze/ poor moonlight, (first qu.)
77	10/9/97	8.13pm	19	15	27	none	-	-	-	no cloud cover or wind/ moderate moonlight; nippy.
78	11/9/97	8.15pm	19	15	27	none	-	-	-	70% cloud cover, cool breeze, light rain/ <i>Gehyra dubia</i> active on ground; filtered moonlight.
79	12/9/97	8.05pm	17	15	27	none	-	-	-	no cloud cover, moderate to strong wind/ ground and leaf litter damp; sugar glider seen at clump of sap; heavy rain fell during the day.
80	13/9/97	8.10pm	19	15	27	none	-	-	-	no cloud cover, cool breeze/ bright moonlight, (waxing gibbous.)
81	14/9/97	8.05pm	19	15	27	none	-	-	-	no cloud cover or wind/ very bright moonlight; nippy.
82	15/9/97	8.25pm	19	14	30	none	-	-	-	no cloud cover or wind/ very bright moonlight (full moon).
83	16/9/97	8.12pm	19	15	27	none	-	-	-	no cloud cover or wind/ very bright moonlight.
84	17/9/97	8.30pm	19	16	30	none	-	-	-	no cloud cover or wind/ bright moonlight.
85	18/9/97	8.20pm	20	16	30	A/ tree f	T	nr	n	10% cloud cover, slight breeze/ full moon, rising.
86	19/9/97	8.40pm	21	19	26	none	-	-	-	80% cloud cover, slight breeze/ no moonlight; an overcast day with light rain.
87	20/9/97	8.30pm	21	19	30	A/ tree g	T	1m/nr	n	10% cloud cover, cool breeze/ no moonlight.
88	21/9/97	8.30pm	22	20	31	none	-	-	-	40% cloud cover, no wind/ two sugar gliders observed, one feeding on sap of <i>A. falciformis</i> , tree r1; heavy rain fell at 7.45pm.
89	22/9/97	8.30pm	22	20	31	none	-	-	-	20% cloud cover, no wind/ no moonlight; <i>Gehyra dubia</i> active on <i>A. falciformis</i> 4m up, next to clump of sap; <i>Pogona barbata</i> 2m's up an <i>A. falciformis</i> , motionless; vernal equinox.
90	4/11/97	7.15pm	nr	20	31	A/ tree f	T	0.3m/nr	n	nr/ sugar glider active on <i>A. falciformis</i> .
91	14/11/97	8.00pm	nr	24	31	A/ tree d	T	nr	y	nr/ adult, gravid female feeding on sap.
92	9/2/98	8.15pm	nr	25	33	A/ tree h	T	1.5m/nr	n	nr
93	25/2/98	8-9.00pm	nr	23	31	S,J/ nr	T,T	nr, 0.3m/nr, up	l	nr/ sap present near head of sub-adult; juvenile has weight (1.5 grams) and dimensions (s.v. 69, t.l. 76mm) similar to newly hatched individuals; when continually disturbed specimen flung itself up into the air (similar to <i>Delma</i>), no vocalisation was heard.
94	26/2/98	1.10- 1.20am	25	24	31	A,A/ nr, tree a	G,G	-	-	no cloud cover, slight breeze/ first specimen was active at base of unmarked <i>A. falciformis</i> , the other specimen was 3m from tree a.
95	26/2/98	9.30pm	27	24	31	J/ nr	T	0.3m/ nr	y	<10% cloud cover.
96	26/2/98	11.00pm	25	24	31	A/ tree f	T	2m/dn	n	light rain/ a large adult.
97	27/2/98	8.15- 8.45pm	26	23	32	J/ nr	T	0.25m/ nr	n	10% cloud cover.
98	27/2/98	9.45- 11.00pm	nr	23	32	none	-	-	-	nr/ sugar glider observed at clump of sap on <i>A. falciformis</i> .
99	28/2/98	7.50- 8.30pm	27	23	32	A,A/ tree h, tree e	T,T	0.3, 0.9m/ nr, up	y, n	nr/ two large individuals; sap present near head of second specimen; both specimens marked with whiteout, sp. A- one mark, 1cm back from dark neck band; sp. B- two marks, 2 cm back from dark neck band.
100	1/3/98	7.45- 8.45pm	24	23	30	none	-	-	-	no cloud cover/ leaf litter damp; heavy rain fell mid-afternoon.
101	2/3/98	7.30- 8.30pm	25	23	32	S,S/ tree l, nr	T, G	0.6m/ up	n	30% cloud cover/ both specimens marked with whiteout, sp. C- three marks, 3cm back from dark neck band; sp. D- one mark on mid-body.
102	3/3/98	7.30- 8.15pm	25	22	32	S,A,S/ tree l, f, nr	T,T,T	nr, 0.8, 0.2m/ nr, up, up	n,n,n	no cloud cover/ first specimen is sp. C, second consecutive night at tree l; specimen fell to ground when disturbed.
103	4/3/98	7.30- 8.15pm	26	23	30	S,A,S/ nr, nr, tree l	T,T,T	0.9m, nr, nr/ up, nr	n,n,n	40% cloud cover, humid/ the first two specimens were active on the same tree; third specimen is sp. C, third consecutive night at tree l; <i>Gehyra dubia</i> photographed feeding on sap of <i>A. falciformis</i> , (tree r2).
104	5/3/98	7.30- 8.30pm	26	23	32	none	-	-	-	no cloud cover; moderate moonlight (first quarter).
105	6/3/98	7.30- 8.30pm	26	23	34	none	-	-	-	no cloud cover; moderate moonlight.

TABLE 1. (cont.)

#	Date	Time	Temp. °C			Active/ loc.	Tree/ Grd.	Height/ Facing	Feed- ing	Weather / comments
			Cu	m	M					
106	7/3/98	8-8.45pm	27	23	36	S,A,S,P/ tree j, d, f, f	T,G,T, T	0.8, 2, 0.9m/ up, dn, dn	l,n,n,n	no cloud cover, moderate moonlight (waxing gibbous)/ sap present near head of first specimen; second specimen resting head on base of tree d; both other specimens active on tree f.
107	8/3/98	8.45- 9.40pm	24	24	33	S,S/ tree l, nr	G,T	<0.1m/ nr	n,l	40% cloud cover, light rain/ first specimen was at base of tree l; second specimen had sap near head; <i>Gehyra dubia</i> observed feeding on sap of <i>A. falciformis</i> , tree r2.
108	12/4/98	8.05pm	nr	23	31	S/ nr	T	0.8m/ up	l	80% cloud cover, humid/ sap present near head.
109	31/12/98	8-9pm	27	23	31	A,J/ nr	T,T	<0.1,1.5 m/ up,hz	n,l	30% cloud cover/ sap present near head of juvenile.
110	11/1/99	9-10pm	26	22	32	J,S/ tree d, rk	T,G	0.1m/ dn	n	no cloud cover, slight breeze/ faecal sample collected from first specimen.
111	9/3/99	7-9pm	nr	23	30	P, nr	T	nr	n	nr/ faecal samples collected for analysis.
112	2/5/99	7-8.00pm	nr	14	26	none	-	-	-	nr
113	7/5/99	7-8.00pm	18	18	26	none	-	-	-	nr/ <i>Diplodactylus vittatus</i> active on ground.
114	8/5/99	7-8.00pm	19	18	25	none	-	-	-	nr/ <i>Diplodactylus vittatus</i> active in leaf litter.
115	15/5/99	8-8.45pm	19	17	28	S/ nr	T	0.5m/ dn	n	no cloud cover/ specimen emitted a soft squeak when handled roughly.
116	22/5/99	6.15-7pm	20	18	nr	none	-	-	-	nr/ <i>Gehyra dubia</i> and <i>Heteronotia bynoei</i> active.
117	28/5/99	6.15-7pm	21	18	26	none	-	-	-	no cloud cover or wind/ <i>Gehyra dubia</i> active on ground.
118	29/5/99	6.30- 7.15pm	20	18	26	none	-	-	-	no cloud cover; full moon.
119	31/5/99	7-7.45pm	20	18	28	none	-	-	-	no cloud cover; full moon.
120	1/6/99	7-8pm	20	19	27	J,J,J/ nr	T,T,T	<0.1, <0.1,1.1 m/up,up, up	y,y,y	slight breeze; waning gibbous, rising/ <i>Heteronotia bynoei</i> active on ground.
121	2/6/99	6.30- 7.15pm	19	16	26	none	-	-	-	slight breeze, cool.
122	3/6/99	6.30- 7.15pm	20	17	25	none	-	-	-	overcast, slight breeze/ <i>Gehyra dubia</i> active on ground.
123	4/6/99	6.30- 7.15pm	19	16	nr	none	-	-	-	no cloud cover or wind.
124	5/6/99	6.30- 7.15pm	19	17	nr	none	-	-	-	100% overcast, no wind, drizzle.
125	6/6/99	6.30- 7.15pm	18	17	24	none	-	-	-	30% cloud cover, no wind; light rain fell during the day, ground damp, tree trunks dry.
126	12/6/99	6.15- 6.45pm	14	10	21	none	-	-	-	no cloud cover or wind.
127	13/6/99	6.10- 6.45pm	19	12	23	none	-	-	-	no cloud cover, moderate wind/ juvenile <i>Gehyra dubia</i> active on <i>A. falciformis</i> trunk.
128	20/6/99	6-6.30pm	16	13	23	none	-	-	-	no cloud cover or wind/ moderate moonlight.
129	30/6/99	7.30- 8.15pm	18	15	22	none	-	-	-	overcast, slight breeze/ rain during the day, trunks of trees and leaf litter still damp.
130	5/7/99	6.45- 7.15pm	18	15	22	none	-	-	-	no cloud cover or wind/ <i>Gehyra dubia</i> active on <i>A. falciformis</i> trunk; <i>Pogona barbata</i> perched on limb of <i>A. falciformis</i> .
131	7/7/99	7.15-8pm	17	16	23	none	-	-	-	no cloud cover or wind.
132	8/7/99	7.45- 8.15pm	17	15	23	none	-	-	-	no cloud cover or wind; nippy.
133	11/7/99	7.15-9pm	18	16	23	none	-	-	-	no cloud cover or wind; warm.
134	12/7/99	6.30- 7.20pm	19	17	24	none	-	-	-	10% cloud cover; slight breeze/ <i>Oedura rhombifer</i> active on <i>A. falciformis</i> ; <i>H. bynoei</i> active on ground.
135	17/7/99	6.30-7pm	16	13	23	none	-	-	-	no cloud cover or wind.
136	19/7/99	6.30-7pm	18	13	25	none	-	-	-	no cloud cover or wind; moderate moonlight.
137	20/7/99	6.30- 7.15pm	16	13	25	none	-	-	-	no cloud cover or wind.
138	23/7/99	6.15- 6.45pm	17	11	20	none	-	-	-	misty; no wind.
139	24/7/99	6.30- 7.00pm	13	13	17	none	-	-	-	30% cloud cover; no wind/ consistent light rain throughout the day.
140	25/7/99	6.20- 7.00pm	17	12	20	none	-	-	-	100% cloud cover; strong wind; mild.

TABLE 2. Body measurements of *P. orientalis*. SVL = snout-vent length, TL = tail length.

Date	SVL (mm)	TL (mm)	Total length (mm)	No. of distinguishable individuals 25/2/98-8/3/98
18/12/90	122	157, regrown	279	N/A
3/4/94	155	regrown	?	N/A
11/1/95	170	192, regrown	362	N/A
26/1/95	69	71, original	140	N/A
28/1/95	72	78, original	150	N/A
21/3/95	152	215, regrown	367	N/A
30/8/97	137	98, regrown	235	N/A
4/9/97	153	232, original	385	N/A
8/9/97	147	201, original	348	N/A
8/9/97	150	189, original	339	N/A
8/9/97	111	111, regrown	222	N/A
8/9/97	151	75, regrown	226	N/A
25/2/98	69	76, original	145	1
26/2/98	182	73, regrown	255	2
26/2/98	174	215, regrown	389	3
26/2/98	70	76, original	146	1?
26/2/98	182	227, regrown	409	4
27/2/98	79	85, original	164	5
28/2/98	182	110, regrown	292	6
28/2/98	190	257, end regrown	447	7
2/3/98	156	188, regrown	344	8
2/3/98	128	156, regrown	284	9
3/3/98	188	165, regrown	353	10
3/3/98	166	249, original	415	11
4/3/98	152	148, regrown recently	300	12
4/3/98	178	240, regrown	418	13
7/3/98	152	202, original	354	14
7/3/98	188	261, end regrown	449	7?
7/3/98	154	151, regrown	305	15
8/3/98	152	207	359	14?
8/3/98	132	183, end regrown	315	16
12/4/98	148	195, original	343	N/A
31/12/98	172	225	397	N/A
31/12/98	97	114	211	N/A
11/1/99	108	132, end regrown	240	N/A
11/1/99	160	broken (roadkill)		N/A
15/5/99	145	212, end regrown	357	N/A
1/6/99	77	90, original	167	N/A
1/6/99	104	118, end regrown	222	N/A

TABLE 3. Measurements of feeding trees of *P. orientalis*.

Tree	SA	SB	SC	SD	SE	SF	SG	SH	A	B	C	D	E	F	G	H	I	J
Dia. 1m up (mm)	55	150	105	110	55	35	55	55	125	150	60	85	75	230	50	130	100	140
Est. height (m)	4	6	5	6	4	4	4	4	5	6	4	5	4	10	5	7	5	5